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A NEW TURBELLARIAN FROM HAWAII.

BY HAROLD HEATH.

The species of flatworm described in the present paper is represented by four individuals dredged by the U. S. F. C. Str. "Albatross" in the Auau Channel between Maui and Lanai Islands, Hawaii, where the depth is 28–43 fathoms and the bottom consists of sand and gravel. With one exception the specimens were in perfect condition and swam actively by means of undulatory movements of the lateral margins of the body, as is the habit of several other species of Turbellaria. Cocaine was used as a narcotizing agent and formaldehyde as a preservative.

The largest specimen is almost circular in outline and measures 35 by 39 mm.; while the next largest is more oval with a length of 42 mm. and an average width of 27 mm. In each case the body is only slightly colored and is restricted to the dorsal surface, where the minute black pigment cells form stippled streaks and blotches. As in other Planoceridæ the mouth is about median, the male copulatory apparatus is directed backward, and in common with other species of the genus *Planocera* the nuchal tentacles are located about one-fourth of the body length from the anterior end. Around the bases of each there is a group of large eyes, while the intermediate brain region is occupied by the smaller voriety which forms two irregular clusters.

The digestive system presents no especially peculiar features. The external mouth, mesially situated, leads into the much plicated pharynx (Pl. XIV, fig. 1), whose length nearly equals one-fourth that of the body. Laterally it is produced into four pairs of diverticula, of which the anterior may be somewhat indistinct. Directly above, that is dorsal to the outer mouth, the opening from the pharynx leads into the main division of the gut, which in turn communicates with five pairs of intestinal branches. These are invariably empty and relatively slender and practically of even calibre throughout their entire extent. Their general arrangement and method of branching may be seen in fig. 1, which likewise shows frequent anastomoses. Lang[1] states that when these occur they appear most clearly in the young individuals, and that in the sexually mature animals they are very seldom seen. Evidently the present species is one of the exceptions, since in fig. 1, which represents an animal with the ovaries barely developed, the anastomoses are not so numerous as in a larger individual where the female reproductive system is fully functional.

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[1] *Die Polycladen, Fauna und Flora des Golfes von Neapel,* 1884.

The brain holds a position about one-fourth the length of the animal from the anterior end of the body, and after treatment with equal parts of formaldehyde and glycerine may be seen with the greatest distinctness to originate two extensive networks, the well-known ventral one and a dorsal system which has, so far as I know, never been seen in whole mounts, though it was traced with considerable accuracy by Lang from a study of sections. The ventral set of nerves develops from the ventral half of the brain by means of several pairs of nerves which have essentially the same origin as those of *P. graffii* (Lang's fig. 4, Pl. 31). These form an extensive meshwork over the entire under surface of the animal, conforming in general to the plan of *P. graffii*, though the main fibres are more delicate and their branching is not so regular.

The dorsal system may be clearly seen with the naked eye to form an extensive network over the entire dorsal surface of the body. Its fibres are generally smaller than those of the ventral side and the branching occurs with less frequency, thus forming meshes of larger size. Three pairs of nerves give it origin, their position and mode of branching being sufficiently well shown in fig. 2 to require no further comment.

In the most favorable specimen the testes are seen to be scattered over the ventral surface, with the exception of the area bounded by the two innermost longitudinal nerves. Under low magnification their arrangement suggests that they and the delicate canals (vasa efferentia) leading from them form an anastomosing system, and in certain favorable situations, and especially in sections, it is possible to demonstrate that such is actually the case. These minor canals combine to form the vasa deferentia, which usually extend anteriorly as well as posteriorly on each side from their T-shaped union with the single branch extending inward to the midline, but in the present species an anterior division has never been discovered. Throughout its entire extent each vas deferens is a moderately convoluted canal which may form a slight anastomosis at some point, as is shown in fig. 1.

The tube resulting from the fusion of the vasa deferentia in the midline passes at once into the small yet muscular seminal vesicle (fig. 5) which is somewhat elliptical in form. From here the canal passes slightly to the left in order to skirt the granular gland, and then by a fairly direct route leads into the bases of the copulatory organ. A short distance from its entrance into this last-named organ it combines with the short duct from the granular gland.

The copulatory apparatus is a cylindrical body of comparatively large size, occupying the midline and all the available space between the body walls. Its inner third is spongy in character and is penetrated by a single canal, the ductus ejaculatorius, which continues to the exterior. The remaining two-thirds, constituting the eversible portion, is provided with powerful muscular walls and is lined with a multitude of spines which belong to three distinct classes (fig. 5). Those adjoining the outer opening, and consequently basally situated when the penis is protruded, appear in sections to be at least eight in number. Of these two are of large size, hook-like (fig. 6), and are clearly seen in surface views to be symmetrically disposed on each side of the midline. The other six, or possibly eight, are considerably smaller, less curved, and although not clearly visible in surface views appear likewise to be symmetrically disposed a short distance within the external opening. The second type of spine is the smallest and the most abundant and occurs throughout the greater part of the penis. Each is somewhat spindle-shaped and the free end is slightly hooked (fig. 3). Toward the inner end of the eversible portion this type of spine shades into others of similar form, but of a greater length and of a somewhat more slender appearance. At the extreme inner end, the tip of the fully extended organ, these slender spines become larger and more highly cuticularized, and their distal halves assume the brownish yellow tint of the first type. Among these are several larger, toothed spines which are represented in fig. 6.

Lang maintains that each of the spines in *Planocera graffii* is merely a modified epithelial cell, and judging from his figure (fig. 4, Pl. 10) all are of the same character and are similar to the smallest type in the present species. While this view appears plausible at first sight, there are reasons for believing that it does not express the true state of affairs in *Pl. hawaiiensis*. Certainly it cannot be held that the huge spines of the first and third types are each a modified epithelial cell. On the other hand each presents the appearance of being a cuticularized papilla, possibly covered with many epithelial cells, though no cell structure now exists, and penetrated by a connective tissue core which clearly shades basalwards into the unmodified fibrous substance of the penis. Furthermore, while each of the smaller spines may be the product of a single cell, there is little indeed in the adult condition to indicate such an origin. Sections show that they are merely projections on transverse cuticularized ridges which encircle the inner wall of the organ.

As usual the ovaries are dorsally placed, and the tubes leading from them join with the uteri which are well defined a short distance anterior to the mouth. From this point they extend backward, fuse in the midline and form a single duct which passes dorsally into the egg canal. Distal to this last-named union the egg canal extends posteriorly for a short distance and enlarges slightly to form the small accessory sac. On the other hand the egg tube passes backward, enlarges slightly to form the shell chamber, beyond which it becomes continuous with the bursa copulatrix. This is a thick-walled, cone-shaped organ whose inner walls are developed into well-defined rugæ almost cuticular in appearance.

The following brief description will serve to distinguish this species from other known forms.

Planocera hawaiiensis sp. nov.

Body tolerably consistent, broadly elliptical or circular. Length of largest specimen 39 mm., width 33 mm. Color wholly lacking or limited to faint, black blotches and streaks on dorsal surface. Nuchal tentacles at end of first fourth of body length; bases surrounded by eyes about twice the size of those of the intermediate area, which form two groups, the greater number in front of the brain. Five lateral and one anterior intestinal branches which are united by frequent anastomoses. Testes and uniting tubes form an anastomosing system. Penis lined with three species of spines or hooks, several being of large size. Bursa large, accessory sac relatively small.

Auau Channel, Hawaii (Station 3,876), 28–43 fathoms.

EXPLANATION OF PLATE XIV.

Fig. 1.—*Planocera hawaiiensis,* ventral view showing digestive and reproductive systems.
Fig. 2.—Dorsal nervous system.
Fig. 3.—One of the spines of the penis (for position see fig. 5).
Fig. 4.—Tentacles, eyes and brain.
Fig. 5.—Central portion of the reproductive system. B, bursa copulatrix; G, granular gland; P, penis.
Fig. 6.—Large penis spine (for position see fig. 5).

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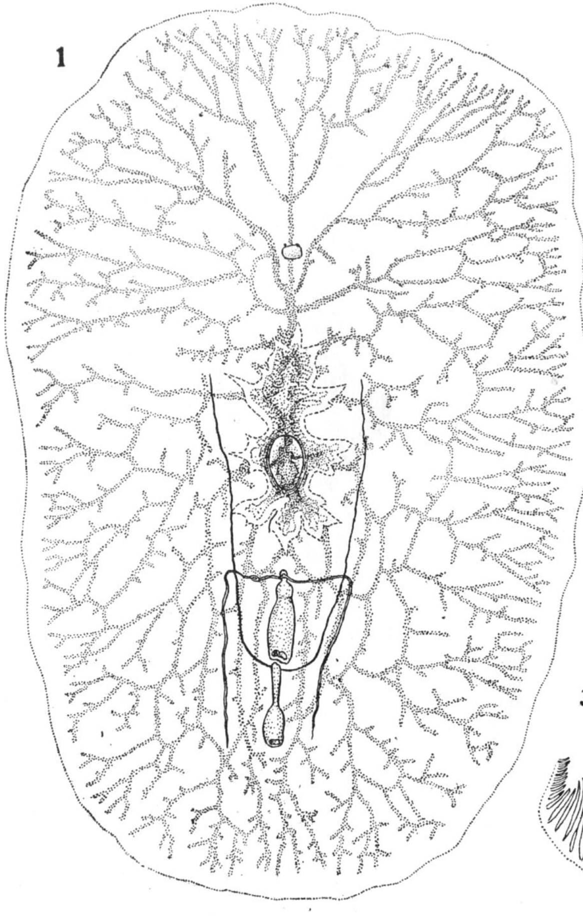

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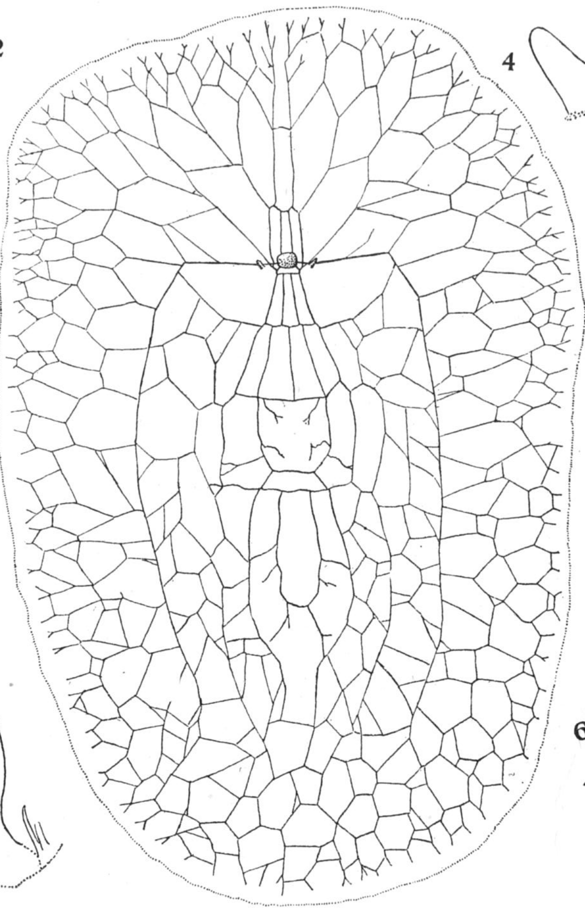

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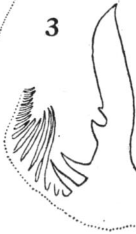

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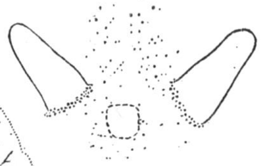

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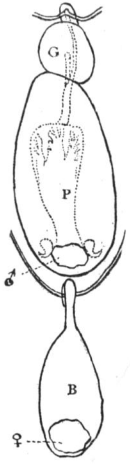

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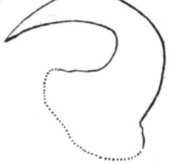

PLANOCERA HAWAIIENSIS HEATH.